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Published in:
Journal of Sol-Gel Science and Technology

DOI:
[10.1007/s10971-013-3018-5](https://doi.org/10.1007/s10971-013-3018-5)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2013

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Ferreira-Neto, E. P., de Carvalho, F. L. S., Ullah, S., Zoldan, V. C., Pasa, A. A., de Souza, A. L., Battirola, L. C., Rudolf, P., Aldabe Bilmes, S., & Rodrigues-Filho, U. P. (2013). Surface structure and reactivity study of phosphotungstic acid-nitrogenated ormosils. *Journal of Sol-Gel Science and Technology*, 66(3), 363-371. <https://doi.org/10.1007/s10971-013-3018-5>

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Surface Structure and Reactivity Study of Phosphotungstic Acid-Nitrogenated Ormosils

Elias P. Ferreira-Neto, Flavio L. S. de Carvalho, Sajjad Ullah, Vinicius C. Zoldan, André A. Pasa, Adriano Lopes de Souza, Liliane C. Battirola, Petra Rudolf, Sara Aldabe Bilmes, Ubirajara P. Rodrigues-Filho

Supporting Information

S.1. Atomic Force Microscopy

The Root Mean Square (RMS) parameter, R_{rms} , is defined as:

$$R_{rms} = \sqrt{\frac{1}{MN} \sum_{k=0}^{M-1} \sum_{l=0}^{N-1} [z(x_k, y_l)]^2}$$

The Surfaces Area Ratio, Sdr, expresses the increment of the interfacial surface area relative to the area of the projected (flat) x,y plane:

$$Sdr = \frac{\left(\sum_{k=0}^{M-2} \sum_{l=0}^{N-2} A_{kl} \right) - (M-1)(N-1)\delta x \delta y}{(M-1)(N-1)\delta x \delta y} 100\%$$
$$A_{kl} = \frac{1}{4} \left(\left(\sqrt{\delta y^2 + (z(x_k, y_l) - z(x_k, y_{l+1}))^2} \right) + \left(\sqrt{\delta y^2 + (z(x_{k+1}, y_{l+1}) - z(x_{k+1}, y_l))^2} \right) \right. \\ \left. + \left(\sqrt{\delta x^2 + (z(x_k, y_l) - z(x_{k+1}, y_l))^2} \right) + \left(\sqrt{\delta x^2 + (z(x_k, y_{l+1}) - z(x_{k+1}, y_{l+1}))^2} \right) \right)$$

For a totally flat surface, the surface area and the area of the xy plane are the same and $Sdr = 0 \%$.

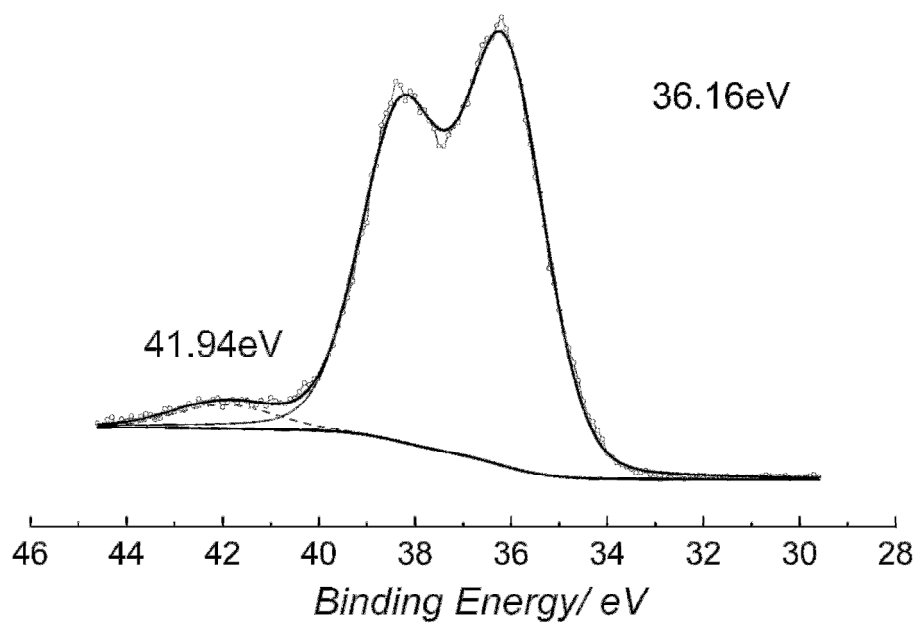


Figure S2: X-ray photoemission spectrum of ormosil-A: W $4f$ and $5p$ core level region